UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/734,597	12/15/2003	Peter James Pool	41557-199752	1464

26694 7590 04/06/2007
VENABLE LLP
P.O. BOX 34385
WASHINGTON, DC 20043-9998

EXAMINER	
NEGRON, WANDA M	
ART UNIT	PAPER NUMBER
2622	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/06/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/734,597	POOL ET AL.	
	Examiner	Art Unit	
	Wanda M. Negrón	2622	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 December 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12, 14-20, and 22-25* is/are rejected.

7)☒ Claim(s) *13 and 21* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. **Claim 7** is objected to because of the following informalities:

Line 1 recites "as claimed in any of claims 1". It is believed that it should recite, "as claimed in claim 1" instead. Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. **Claim 7 is rejected under 35 U.S.C. 112, second paragraph**, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 7 is drawn to a separator for separating the excess charge from the remaining signal charge of the signal charge transferred from the output register. It is unclear how the excess charge is present in the signal charge from the output register since the charge from the output register has not been multiplied, and therefore excess charge could not be present at the time transfer occurs from the output register to the separator. Appropriate correction is required.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. **Claims 1, 2, 4, 5, 9, 12, 14, 15, 20 and 22 are rejected under 35 U.S.C. 102(b) as being anticipated by Hynecek (EP Patent Application Publication 1152469 A2).**

6. Regarding **claim 1**, Hynecek discloses a solid state imager arrangement (see figure 1) comprising an image area (102), an output register which receives signal charge from the image area (104), a separate multiplication register into which signal charge from the output register is transferred (105), means for obtaining signal charge multiplication by transferring the charge through a sufficiently high field in elements of the multiplication register (see col. 1, lines 30-40 and col. 5, lines 39-43), and an additional register into which excess signal charge is transferred (106).

7. Regarding **claim 2**, Hynecek discloses that the excess signal charge is that exceeding a threshold level (see col. 4, lines 26-36).

8. Regarding **claim 4**, it is inherent that the excess signal charge is a percentage of the signal charge received from the image area, i.e. the excess charge originated from and is comprised partly by the signal charge received from the image area.

9. Regarding **claim 5**, Hynecek discloses that the excess signal charge is transferred to the additional register via one or more elements of the multiplication register (see figure 2).

10. Regarding **claim 9**, Hynecek discloses that the amount of excess charge transferred to the additional register is determined by implanted barrier means (see col. 6, lines 10-18).

11. Regarding **claim 12**, Hynecek discloses including means for combining signal charge (111) after it has been transferred through the multiplication register with excess charge from the additional register (see figure 1).

12. Regarding **claim 14**, Hynecek discloses including a plurality of additional registers (307, 308) associated with the multiplication register.

13. Regarding **claim 15**, Hynecek discloses that a sufficiently high field region is obtained in each element of the multiplication register (see figure 2 and col. 5, lines 39-43).

14. Regarding **claim 20**, Hynecek discloses that the charge capacity of at least some of the elements of the multiplication register is larger than that of elements of the output register (see figure 2 and col. 5, lines 39-43).

15. Regarding **claim 22**, Hynecek discloses a CCD imager comprising the solid state imager arrangement as claimed in claim 1 (see figure 1).

Claim Rejections - 35 USC § 103

16. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

17. **Claims 3, 11, 16, 18 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hynecek (EP Patent Application Publication 1152469 A2).**

18. Regarding **claim 3 and 11**, as mentioned in the discussion of claim 1 above, Hynecek discloses all the limitations of the parent claim. Official notice is taken that variable overflow barriers using a typical gate, which would control the excess signal charge threshold level, are well known in the art. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have a variable threshold level by controlling the height of the overflow barrier including a gate means because the sensitivity of the CCD image sensor, i.e. the amount of charge remaining in the high sensitivity channel (see col. 4, lines 27-44), can be adjusted accordingly.

19. Regarding **claim 16 and 17**, as mentioned in the discussion of claim 1 above, Hynecek discloses all the limitations of the parent claim. Official notice is taken that synchronizing signal readout with line timing of a television rate signal is well known in the art. Since the readout portion of the image sensor would comprise the output register, the multiplication register and the excess charge register, it would have been obvious to one having ordinary skill in the art at the time the invention was made to synchronize the readout from the output register, the multiplication register and the excess charge register with line timing of a television rate signal in order to use the image sensor disclosed by Hynecek in television applications.

20. Regarding **claim 18**, as mentioned in the discussion of claim 1 above, Hynecek discloses all the limitations of the parent claim. Official notice is taken that controlling the amplitude of one or more drive pulses applied to a register in order to control the amount of signal charge multiplication, and therefore controlling the sensitivity of the CCD sensor, is well known in the art. It would have been obvious to one having

ordinary skill in the art at the time the invention was made to control the amount of signal charge multiplication by controlling the amplitude of one or more drive pulses applied to a register because the sensitivity of the CCD, i.e. the amount of excess charge induced in the multiplication register (see paragraph [0003]), can be adjusted accordingly.

21. Regarding **claim 19**, as mentioned in the discussion of claim 1 above, Hynecek discloses all the limitations of the parent claim. Official notice is taken that controlling the level of one or more dc potentials applied to a register to control the amount of signal charge multiplication, and therefore controlling the sensitivity of the CCD sensor, is well known in the art. It would have been obvious to one having ordinary skill in the art at the time the invention was made to control the amount of signal charge multiplication by controlling the level of one or more dc potentials applied to a register because the sensitivity of the CCD, i.e. the amount of excess charge induced in the multiplication register (see paragraph [0003]), can be adjusted accordingly.

22. **Claims 6, 8, 10 and 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hynecek (EP Patent Application Publication 1152469 A2), and further in view of Kaplan (US 5,867,215).**

23. Regarding **claims 6 and 8**, as mentioned in the discussion of claim 1 above, Hynecek discloses all the limitations of the parent claim. However, Hynecek does not explicitly disclose that the excess signal charge is transferable from each element of the

multiplication register to the additional register, which entails having a multiplication and an additional register with the same number of elements.

Kaplan, on the other hand, discloses transferring excess charge from a CCD well 14 to another CCD well 16 in order to preserve excess electrons (see col. 4, lines 34-39) providing a wider dynamic range (see col. 3, lines 54-55).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to transfer the excess signal charge from each element of a CCD register to another CCD register, as taught by Kaplan, in the solid-state image sensor with multiplication register and additional register disclosed by Hynecek because the size of the imager can be reduce by eliminating the width increase of the multiplication register (see Hynecek, figure 2).

24. Regarding **claim 10**, as mentioned in the discussion of claim 1 above, Hynecek discloses all the limitations of the parent claim. However, Hynecek does not explicitly disclose that that the barrier means is located between the multiplication register and the additional register

Kaplan, on the other hand, discloses transferring excess charge from a CCD well 14 over barrier 22 to another CCD well 16 in order to preserve excess electrons (see col. 4, lines 34-39) providing a wider dynamic range (see col. 3, lines 54-55).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to transfer the excess signal charge from each element of a CCD register over a barrier to another CCD register, as taught by Kaplan, in the solid-state image sensor with multiplication register and additional register disclosed by Hynecek

because the size of the imager can be reduce by eliminating the width increase of the multiplication register (see Hynecek, figure 2).

25. Regarding **claim 23**, Hynecek discloses a solid state imager arrangement comprising an image area (102), an output register which receives signal charge from the image area (104), a multiplication register (105) comprising a plurality of multiplication elements (206) into which signal charge from the output register is transferred for charge multiplication, an additional register (106) comprising additional elements arranged to receive excess signal charge from the multiplication register (306). However, Hynecek does not explicitly disclose a clocking arrangement, wherein the clocking arrangement is arranged to clock the excess signal charge from the multiplication elements to corresponding ones of the additional elements.

Kaplan, on the other hand, discloses transferring excess charge from a CCD well 14 over barrier 22 to another CCD well 16 in order to preserve excess electrons (see col. 4, lines 34-39) providing a wider dynamic range (see col. 3, lines 54-55). Kaplan also discloses using a typical gate, which would be inherently controlled by a clocking arrangement to clock the excess signal charge from CCD well 14 to CCD well 16, to make the barrier 22 variable (see col. 5, lines 6-10).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to transfer the excess signal charge from each element of a CCD register over a barrier to another CCD register, as taught by Kaplan, in the solid-state image sensor with multiplication register and additional register disclosed by Hynecek

because the size of the imager can be reduce by eliminating the width increase of the multiplication register (see Hynecek, figure 2).

26. Regarding **claim 24**, Hynecek, as modified by Kaplan, discloses that the clocking arrangement comprises clocked wells, i.e. CCD wells defined by the height of the clocked variable barrier (see Kaplan, elements 14 and 16), arranged so that excess signal charge is transferred from the multiplication elements to the corresponding ones of the additional elements without charge from the additional elements returning to the multiplication elements (see Kaplan, col. 4, lines 34-39).

27. Regarding **claim 25**, official notice is taken that the use of a timing generator for generating all the timing signals required in a typical image sensor is well known in the art. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have a clock source, i.e. a timing generator operating with one oscillator, the clock source also being arranged to clock the multiplication and/or the additional registers because by using a timing generator only one oscillator is required making the image sensor design less complex.

Allowable Subject Matter

28. **Claims 13 and 21** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

29. The following is a statement of reasons for the indication of allowable subject matter:

Regarding **claim 13**, the prior art fails to disclose, reasonably suggest or render obvious that the **signal charge multiplication is obtained in the additional register**.

Regarding **claim 21**, the prior art fails to disclose, reasonably suggest or render obvious to include in a solid-state image arrangement **a plurality of multiplication registers arranged to receive signal charge from the output register**, at least one of the plurality having associated therewith an additional register.

30. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wanda M. Negrón whose telephone number is (571) 270-1129. The examiner can normally be reached on Mon-Fri 6:30 am - 4:00 pm alternate Fri off.

31. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Ometz can be reached on (571) 272-7593. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

32. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Wanda M. Negrón
March 30, 2007

DAVID OMETZ
SUPERVISORY PATENT EXAMINER